

REMARKS

In the Office Action of November 5, 2009 the Office noted that claims 1-28 were pending and rejected claims 1-28. In this amendment claims 1 and 25 have been amended, no claims have been canceled, and, thus, in view of the foregoing claims 1-28 remain pending for reconsideration which is requested. No new matter has been added. The Office's rejections and objections are traversed below.

CLAIM OBJECTION

Claim 25 stands objected to for informalities. In particular, the Office asserts that the claim 25 mixes statutory types. The Applicants have amended the claims to overcome the objection. The Applicants submit that no new matter is believed to have been added by the amendment of the claim.

Withdrawal of the objection is respectfully requested.

REJECTIONS under 35 U.S.C. § 112

Claims 23, 24, 26 and 27 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. In particular, the Office asserts that "the spatial characteristics of the reproduction unit are determined without using the multi-channel audio signal" is not supported in the Specification.

However, support for this feature is found in ¶ 0076,

0077 and 0095-0108 of the printed publication version of the Specification, where the processing performed at calibration step 30 enabling characteristics of the reproduction unit 2 to be determined does not use at any moment the multi-channel audio signal.

The Office asserts that "the spatial adaptation matrix is determined without using the multi-channel audio signal" is not supported in the Specification.

However, support for this feature is found in ¶ 0164 of the printed publication version of the Specification which concerns an embodiment wherein the elements of the spatial adaptation matrix A are constants and thus are determined without using the multi-channel audio signal.

Withdrawal of the rejections is respectfully requested.

REJECTIONS under 35 U.S.C. § 103

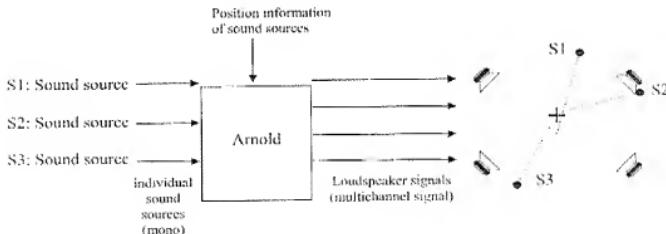
Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being obvious over Arnold, U.S. Patent No. 6,154,549 in view of Ise, JP 11-168792. The Applicants respectfully disagree and traverse the rejection with an argument.

Fig. 1 of Arnold describes an apparatus for controlling the perceived position of sound sources in a spatial environment relative to one or more listeners.

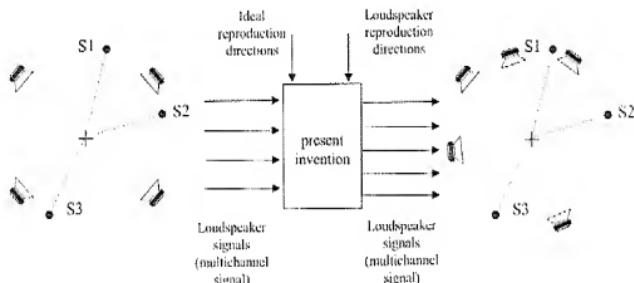
The apparatus disclosed in Arnold comprises one or more sound sources 10 and reproduction elements 16.

It is respectfully submitted that in the Office Action, the Office interprets the term "multi-channel signal" in an overly broad manner. In fact, a multi-channel signal is not a set of signals representing individual sound sources. Arnold does not disclose receiving multi-channel signals as input.

Consider, Arnold, col. 9, lines 4-6 which states "the present invention provides the ability to perceptually position multiple simultaneous sound sources in the spatial environments." In view of this, Arnold positions individual sound sources over a particular loudspeaker layout to create a spatial environment. Further, Arnold gives example of monophonic sound sources (without spatial information) to be positioned in the spatial environment (col. 9, lines 36-49). Arnold uses position information about the source in order to generate the correct loudspeaker signals (col. 10, line 48). This type of process is typically used in studios to create from the individually recorded sound sources a multi-channel signal to feed the loudspeakers as illustrated below.



The present invention, using the same terminology as Arnold, describes a process to reproduce over a loudspeaker layout a spatial environment that was originally created for a different loudspeaker layout, while retaining the position of the sound sources within the spatial environment. In other words, the present invention, as embodied in the claims, adapts a multi-channel signal to the actual loudspeaker layout as illustrated below.



The Applicants acknowledge that Arnold and the present invention are in fact complementary: Step 1: Arnold creates a spatial environment for a particular loudspeaker layout (a multi-channel signal), Step 2: the present invention reproduces this multi-channel signal over a different loudspeaker layout maintaining correct source positions without using the original mono sound sources.

A multi-channel signal as described and claimed in the present invention is not a set of signals where each signal represents a sound source as described in Arnold. A multi-

channel signal is a complete sound environment ready to be reproduced by loudspeakers and containing all the sound sources contributing to the sound environment. A multi-channel signal is typically the sound track of a movie, a stereo or a music recording. In a multi-channel signal, the direction associated with each channel is fixed and defined in a format. The difference is obvious when a sound source is moving:

- In a multi-channel signal, the loudspeaker positions are fixed and the channels are changing.
- In a "multi sound sources" signal, the source signals are unchanged and the source position information is changing.

The difference between "monophonic sound sources" and multi-channel signal is explained by Arnold (col. 1 line 14 through col. 3 line 45). In particular Arnold describes multiple techniques to create a multi-channel signal from monophonic sources: 2 channels multi-channel format called stereo (col. 1 line 58 through col. 2 line 9), 4 channels multi-channel format called quadraphony (col. 2 lines 10-33), a 3 channel multi-channel format (col. 2 lines 33-53), a method called panning to generate multi-channel signals (col. 3, lines 25-45).

Therefore, Arnold does not attempt to reproduce a multi-channel signal but multiple mono sound sources.

In Arnold, a controller 30 provides a position or a direction signal to a program 32 which wishes to produce a sound in a spatial environment.

In Arnold, the position or direction signal corresponds to the direction of the sound source to be positioned. Whereas in the present invention, the position or direction signals correspond to the positions or directions of the ideal loudspeakers of the multi-channel signal and of the real high speakers used for the reproduction.

In the Office Action it appears that the Office considers controller 30 enables the determination of parameters describing the reproduction direction of each channel of a multi-channel audio signal and the determination of a spatial adaptation table using the determined directions of the reproduction elements and the parameters describing the reproduction. (Arnold, Figs. 1-6 and col. 11, line 1 through col. 12, line 36 are cited to assert this rejection.)

The Applicants respectfully disagree since as described above, a channel is not a source. The direction associated with each channel is a fixed data defined in a format. It is not a variable adjustable by the user or a controller.

In contrast, the present claims correct the position of loudspeaker and it is not an invention for allocating a position to monophonic sound sources.

The Office also asserts that the program 32 of Arnold enables the determination of at least spatial characteristics of the reproduction unit, the spatial characteristics comprising at least the direction of each reproduction elements in the three

spatial dimensions relative to a given point, the determined directions of the reproduction elements being different from the reproduction directions of the multi-channel audio signal.

The Applicants respectfully disagree. The Applicants submit that the Office takes the interpretation as in the rejection due to the fact that they consider a channel as a source, which as explained above, is not the case.

Arnold Figs. 1-6 discuss an apparatus enabling to perceptually position a plurality of simultaneous sound sources in a spatial environment by controlling the amplitudes of the sounds produced by the reproduction elements 16 (col. 10, lines 14-34). Therefore, Arnold does not disclose a method of correcting the error of positioning loudspeakers.

On page 5 of the Office Action, it is acknowledged that Arnold does not disclose "determining via a computer a spatial adaptation matrix using the determined directions of the reproduction elements and the parameters describing the reproduction directions, wherein the spatial adaptation matrix is determined such that controlling the reproduction elements with the controlling signals reproduces, in a region comprising the given point, the acoustic field that would have been obtained by controlling, with the multi-channel audio signal, ideal reproduction elements which would exactly comply with the reproduction directions of the multi-channel audio signal," as in claim 1.

However, Ise does not disclose the determination of a spatial adaptation matrix since the adaptive filters of Ise do not enable to adapt the reproduction directions associated to the multi-channel sound signal to the spatial characteristics of the reproduction unit.

For at least the reason discussed above, Arnold and Ise, taken separately or in combination, fail to render obvious the features of claims 1 and 15 and the claims dependent therefrom.

Withdrawal of the rejections is respectfully requested.

SUMMARY

It is submitted that the claims satisfy the requirements of 35 U.S.C. §§ 112 and 103. It is also submitted that claims 1-28 continue to be allowable. It is further submitted that the claims are not taught, disclosed or suggested by the prior art. The claims are therefore in a condition suitable for allowance. An early Notice of Allowance is requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON

/James J. Livingston, Jr./
James J. Livingston, Jr.
Reg.No. 55,394
209 Madison St, Suite 500
Alexandria, VA 22314
Telephone (703) 521-2297
Telefax (703) 685-0573
(703) 979-4709

JJL/fb